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59. (New) The in-process semiconductor of claim 53 wherein at least some of the contacts comprise silicon germanium.--

REMARKS

In an office action mailed February 3, 2003, the Examiner rejected claims 30-46 and 49 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,854,105 to Tseng ("Tseng"), and rejected claims 47-48 and 50-51 under 35 U.S.C. § 103(a) as being unpatentable over Tseng in view of U.S. Patent No. 6,130,102 White, Jr. *et al.* ("White").

Before discussing the rejection of the pending claims, the disclosed embodiments of the invention will now be discussed in comparison to the applied references in order to help the Examiner appreciate certain distinctions between the pending claims and the subject matter of the applied references. Specific distinctions between the pending claims and the references will be discussed after the discussion of the disclosed embodiment and the references. This discussion of the differences between the disclosed embodiment and the applied references does not define the scope or interpretation of any of the claims.

Applicants invention is directed to a process and devices including selectively formed contacts for electrically interconnecting components on an integrated circuit. The contacts have an increased vertical growth rate relative to a lateral growth rate during formation of the contacts. In this way, adjacent contacts may be formed in integrated circuits having reduced dimensions of components forming the integrated circuit since the lateral growth rate of the contacts will not cause adjacent contacts to electrically short circuit. Figure 2 illustrates an overall process of selectively forming contacts 200-204 on a substrate 206 according to one embodiment of the present invention. To begin the process, a selective epitaxial growth (SEG) process is started, causing the contacts 200-204 to begin forming over the regions 214-218, respectively. At the same time, electromagnetic radiation 208, or some other type of directed thermal energy, is applied to begin heating upper surfaces 220 of the contacts 200-204. The radiation 208 heats the upper surfaces 220, causing a vertical growth rate 226 of each contact 200-204 to increase relative to a lateral growth rate 228 of the contact. The lateral growth rates 228 of each contact 200-204 do not increase significantly because the intensity of the radiation on sidewall surfaces 222, 224 is small relative to the intensity on the upper surfaces 220. As a

result, the contacts 200-204 grow at a faster rate in the vertical direction 226 than in the lateral direction 228. The relatively smaller lateral growth rate 228 results in less lateral growth of each contact 200-204 during the time the contact is being formed. As a result, the sidewall surfaces 222, 224 are more vertical than the sidewalls of contacts formed according to the conventional process of Figure 1.

The reduced lateral growth rate 228 relative to the increased vertical growth rate 226 enables contacts 200-204 to be selectively formed having a desired height H in semiconductor integrated circuits having reduced lateral spacing between devices. As seen in the example of Figure 2, the reduced lateral growth of the contacts 200 and 202 results in the contacts being formed only slightly over the isolation oxide region 210, while the increased vertical growth rate 226 enables the contacts to be grown to the desired height H. In Figure 2, the surfaces that are significantly heated by the applied radiation 208 are indicated via the thicker lines.

The Tseng patent discloses a dynamic random access memory (DRAM) memory cell have a new structure for forming a storage capacitor in each cell. The structures shown in Figures 1 and 2 of Tseng show an access transistor of a given memory cell formed by source and drain regions 17, 19 and a control stack formed by layers 14-20. A polysilicon layer 26 is also shown forming a contact to the region 19. This contact region is formed via a LPCVD process and is not a selectively formed, as Figure 2 plainly shows by the fact that the layer 26 extends not just to through a layer 24 to contact the region 19 but also extends on an upper surface of the layer 24. Tseng does not disclose the layer 26 being a selectively formed contact, and, moreover, as Figures 3 and 4 show the portions of the layer 26 formed on the upper surface of the layer 24 are actually used in the structure of Tseng. If the layer 26 were a selectively formed contact, then once isolation region 28 was formed, the layer 26 would be isolated from other components in the structure and the contact of layer 26 with region 19 would be useless. The Examiner cited the White patent merely for disclosing the substrate being silicon germanium or gallium arsenide.

Amended claim 38 recites an in-process substrate structure including a plurality of contact regions and a plurality of non-contact regions adjacent the contact regions on a surface of the substrate. The in-process substrate structure includes a selectively formed contact on each

contact region, each contact being isolated from contacts on adjacent contact region. Tseng does not disclose or suggest selectively formed contacts as recited in claim 38. The Examiner references Figures 1 and 2 of Tseng, and points to a polysilicon layer 26 as being a selectively formed contact. As previously discussed, however, the layer 26 is not a selectively formed contact as set forth in claim 38. Moreover, in Tseng selectively formed contacts would complicate construction of the disclosed memory cell structure, and thus Tseng actually teaches away from selectively forming such contacts. The combination of elements recited in claim 38 is thus allowable.

New claim 52 recites an in-process semiconductor structure including a substrate, a plurality of active regions, a plurality of isolation regions adjacent the active regions, each isolation region being positioned between adjacent active regions to isolate adjacent active regions and no layers being formed on the isolation regions. The structure includes at least one selectively formed contact region on each active region, where each selectively formed contact region is isolated from contacts on adjacent active regions. Once again, Tseng neither discloses nor suggests a semiconductor structure as recited in new claim 52. Specifically, Tseng does not disclose or suggest selectively formed contacts, and actually teaches away from the use of such contacts as previously discussed. Moreover, in Tseng the isolation regions have other layers formed thereon, and in fact this must be the case to form the described memory cell structure. Accordingly, the combination of elements set forth in new claim 52 is allowable.

The claims dependent on the independent claims are allowable for the same reasons as the independent claims, and because of the additional limitations added by the dependent claims.

All pending claims are in condition for allowance, and favorable consideration and a Notice of Allowance are respectfully requested. The Examiner is requested to contact the undersigned at the number listed below for a telephone interview if, upon consideration of this amendment, the Examiner determines any pending claims are not in condition for allowance. The undersigned also requests the Examiner to direct all future correspondence to the address set forth below in the event the Examiner shows a different correspondence address for the attorney of record.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made".

Respectfully submitted,

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SHA:asw

Enclosures:

Postcard

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

Claims 30-37 and 39-44 have been cancelled.

Claim 38 has been amended as follows:

38. (New) An in-process substrate structure including a plurality of contact regions and a plurality of non-contact regions adjacent the contact regions on [an upper] a surface of the substrate, the in-process substrate structure comprising:

a selectively formed contact [formed] on each contact region, each contact being isolated from contacts on adjacent contact regions [having a top surface and two sidewall surfaces disposed between the top surface and the upper surface of the substrate, the top surface being heated to increase a vertical growth rate of the contact relative to a horizontal growth rate of the contact so that each sidewall remains substantially vertical and overlap of the contact into adjacent non contact regions due to lateral growth is limited].